ACTIVITY 9

FINDING SOURCES OF AIR POLLUTION

This activity calls for students to locate on a map the potential areas of air pollution in their community. It is related to the "Prediction" and "Where's That Odor?" warm-ups. Related activities include "Is Your Air Clean?" and "Deciding to Clean the Air."

CRITICAL OBJECTIVES

- Identify the possible sources and types of air pollution in the community based on observations
- Predict and locate on a map potential areas of pollution in the community

SKILLS

- Researching
- Observing
- Organizing information
- Predicting

GUEST PRESENTERS

Guest presenters could include EPA enforcement specialists, EPA environmental protection specialists, EPA policy analysts, lawyers, or state air pollution permit writers.

BACKGROUND

The atmosphere is necessary for plants, animals, and people to live. Air pollution is any visible or invisible particle or gas found in the air that is not part of the normal composition of air. Natural air pollution caused by volcanoes, forest fires, and other natural occurrences has always existed. Naturally produced pollutants are present in greater amounts than those of human origin. They do not present as serious a problem as man-made pollutants, however, because they are dispersed over large areas, and many are less harmful than man-made ones. Air pollution from man-made sources is the result of our increasing use of large quantities of fuel to produce electricity and to power automobiles, trucks, and other vehicles and industrial activity. Not only are some of these pollutants very harmful, but also they tend to be concentrated in urban areas where many people live and work. Many of these air pollutants come from burning the coal, oil, wood, and other fuels we use to run factories, cars, and the power plants that generate heat and light for our homes. Six have been designated "criteria" pollutants: particulate matter, sulphur dioxide, nitrogen oxides, car-

RELATED WARM-UP
A

REFER TO READING MATERIALS
"Air Pollution"
"Health Effects"
"Smog"
"Acid Deposition"
"Automobiles and Air Pollution"
"The Clean Air Act"

TARGET GRADE LEVEL
8th - 12th

DURATION
40 minutes

VOCABULARY
Ambient air quality standards
Carbon monoxide
Clean Air Act
Criteria pollutants
Lead
Nitrogen oxides
Ozone
Particulate matter
Sulphur dioxide
Toxic Release Inventory

MATERIALS
A large street map of the community
Push pins in several colors
Chalkboard
Chalk

WORKSHEETS INCLUDED
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bon monoxide, ozone, and lead. (A table describing these pollutants, their sources, and their effects is included as a student handout.) The EPA has set National ambient air quality standards to protect health and welfare in connection with these pollutants. When these standards are exceeded, the EPA can take steps to control pollutant emissions. (See reading materials on "Air Pollution," "Health Effects," "Smog," "Acid Deposition," "Automobiles and Air Pollution," and "The Clean Air Act.")

WHAT TO DO

1. Explain that in a few days (use specific date if you have it) someone who works for the EPA is coming to visit the class. To prepare for the visit, the class is going to talk about pollution, air pollution in particular.

2. Pass out the worksheets. Ask the students if they think there is air pollution in your community. If they say yes, ask if air pollution is always visible. If they say no, ask how they can tell it's there. What are some of the signs of pollution that they might see? Record the signs of air pollution suggested by students on the chalkboard and instruct students to list them on their worksheets under the "Signs of Pollution" heading. If necessary, prompt the brainstorming by listing "smoke" as a sign of pollution. The completed list should include smoke, odors, smog, stunted or discolored plants and trees, and damaged or discolored buildings and statues.

3. Ask the students if air pollution affects people. If they say yes, ask how. Record students' answers on the chalkboard and instruct them to list them on their worksheets under the "Health Effects of Pollution" heading. (If necessary, prompt students by asking if they know anyone who has asthma or other breathing problems. The criteria air pollutants can cause or contribute to problems like these, plus headaches; irritated eyes; and brain, heart, kidney, and lung damage.)

4. Ask students where they think the pollution in your community comes from. What are the sources of the pollution? Record the sources suggested by students on the chalkboard and instruct students to list them on their worksheets under the "Sources of Pollution" heading. (If necessary, prompt students by listing "cars and trucks" as the first example. The completed list should include cars and trucks, local industries, and local electric power plants, at

a minimum. Other possibilities could include dry cleaners, gas stations, and windblown dust.)

5. Place the map on an easel or hang it on a wall where it can be seen by the students. Point out significant landmarks such as the school, the city/town hall, major factories, and shopping malls. Ask students to help you mark on the map some of the possible sources of air pollution in the community. Explain that the map will be used as a starting point for discussion when the EPA official comes to visit.

6. Divide the class into teams. Assign each team the responsibility for gathering information outside of class to help refine the map by adding other pollution sources and finding out what pollutants various sources release. Suggest that the local health department, planning department, or environmental board (office) can provide information on sources of pollution in the community. In addition, access to EPA's Toxic Release Inventory (TRI) may be available in your area. The TRI is a database containing information about the amount of toxic chemicals released into the air by manufacturing and other facilities. Information on the libraries and other facilities in your area with access to the database can be obtained by calling the Emergency Planning and Community Right-To-Know Hotline, 1-800-535-0202.

7. Select (or let the class nominate) students to make short presentations on the information the students have developed about signs, effects, and sources of air pollution at the beginning of the EPA official's visit.

SUGGESTED EXTENSIONS (OPTIONAL)

☼ Assign each team the responsibility of designing an attractive way (possibly a poster) to present the lists developed in today's class. For example, one team could prepare a poster on signs of pollution; one team could work on health effects of pollution; the third team on sources.

SUGGESTED READING

Air and Water: Concerns for Planet Earth (VHS videotape). United Learning (1991).

Bailey, Donna. *What Can We Do About Noise and Fumes*. New York: Franklin Watts (1991).

Baines, John. *Conserving Our World, Conserving the Atmosphere*. Austin, TX: Steck-Vaughn Company (1990).

Becklake, John. *Thinking for the Future: Pollution*. New York: Gloucester Press (1990).

Gutnik, Martin J. *The Challenge of Clean Air*. Hillside, NJ: Enslow Company (1990).

Hare, Tony. *Save Our Earth: Acid Rain*. New York: Gloucester Press (1990).

Leinwand, Gerald. *The Environment: American Issues*. New York: Facts on File (1990).

Moos, Shawna. "Pollution-Prevention Power to the People (EPA's Toxics Release Inventory Database)." *Technology Review*, 95 (October 1992) p. 15.

O'Neill, Catherine. "Cleaner Air! Cough! Wheeze! Gasp!" *Washington Post (Washington Health)*, 115 (6 October 1992) p. WH18.

Penny, Malcolm. *Our World: Pollution and Conservation*. Englewood Cliffs, NJ: Silver Burdette Press (1988).

Stille, Darlene. *The Ozone Hole*. Chicago: Children's Press (1991).

STUDENT WORKSHEET 1

FINDING SOURCES OF AIR POLLUTION

SIGNS OF POLLUTION	
HEALTH EFFECTS OF POLLUTION	
SOURCES OF POLLUTION	

STUDENT HANDOUT

FINDING SOURCES OF AIR POLLUTION

MAJOR MAN-MADE AIR POLLUTANTS

POLLUTANT	DESCRIPTION	SOURCES	SIGNS/ EFFECTS
Carbon monoxide (CO)	• colorless, odorless gas	• vehicles burning gasoline • indoor sources, including kerosene, wood-burning, natural gas, coal, or wood-burning stoves and heaters	• headaches, reduced mental alertness, death • heart damage
Lead (Pb)	• metallic element	• vehicles burning leaded gasoline • metal refineries	• brain and kidney damage • contaminated crops and livestock
Nitrogen oxides (NO_x)	• gaseous compounds made up of nitrogen and oxygen	• vehicles • power plants burning fossil fuels • coal-burning stoves	• lung disorder • react in atmosphere to form acid rain • combines to deteriorate buildings and statues • adds to forest damage • form ozone & other pollutants (smog)
Ozone (O_3)	• gaseous pollutant	• vehicle exhaust and certain other fumes • formed from other air pollutants in the presence of sunlight	• lung disorder • eye irritation • respiratory tract problems • damages vegetation • smog
Particulate matter	• very small particles of soot, dust, or other matter, including tiny droplets of liquids	• diesel engines • power plants • industries • windblown dust • wood stoves	• lung disorder • eye irritation • damages crops • reduces visibility • discolors buildings and statues
Sulphur dioxide (SO_2)	• gaseous compound made up of sulphur and oxygen	• coal-burning power plants and industries • coal-burning stoves • refineries	• eye irritation • lung damage • kills aquatic life • reacts in atmosphere to form acid rain • damages forests • deteriorates buildings and statues